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CLOCKS.

THE earliest division of time was doubtless by the rising and setting of the sun, into days and nights; the next, by the moon's changes, into "moons" or months; the next, by the phenomena of temperature, vegetative rest or activity, and the prevalence or the lack of rain, into seasons; and finally, after the others a long way, by the motion of the sun among the constellations, into years. But the division of the day seems to have been an idea slow to dawn upon the race, and the tedious, bungling efforts to reach this accurately constitute one of the most laughable records of the stumblings of human wit. Sun-dials and water-clocks contented, or at least had to suffice, the fathers of the race. The first record of a sun-dial is said to be 742 B.C., and the Greeks about 100 B.C. used water-clocks to denote time in their courts of justice. About the latter date also sand-glasses were invented.

For many centuries elegant and refined nations and barbaric ones alike relied upon these rude time-keepers. The patient industry of cloistered monk and the subtle intelligence of Saracen artificer improved the water-clock, though neither could get above it, and some of their handiwork deserves high consideration among ingenious curios if not among accurate time-keepers. The Caliph Haroun Al-Raschid, in 807, presented Charlemagne with a clock in which wheels

were moved by falling water. In the dial were twelve small doors for the hours, each door opening in turn and letting out a brass ball or balls to strike the proper number for the hour by falling on metal beneath. The doors remained open till twelve o'clock, when a mounted knight issued from each of them and the twelve knights paraded round the dial-plate. In 1690 a Benedictine monk invented a water-clock in which a thread attached to a frame connected with a thin cylinder having cells so arranged that water should slowly flow from one cell to another in a way to move the cylinder in a regular manner, and thus cause the thread attached to the cylinder to indicate the time upon the frame.

Among our unnamed benefactors is he who conceived the idea of moving clocks by weights. The first writer who alludes to a striking clock is Dante, who was born in 1265 and lived fifty-six years. We know, however, that such clocks were used in England in 1288, for in that year a fine imposed on the Chief Justice of the King's Bench was appropriated to a clock near Westminster Hall, to be heard by the law courts there. In 1326 the Abbot of St. Albans invented a clock showing the hours, the apparent motion of the sun, the moon's changes, the ebb and flow of the tides, etc. But the most ancient clock of which we have any details of the construction is that of Henry de Wyck, erected in 1379 in the

tower of the palace of Charles V. At the close of the same century was constructed the famous clock of Strasburg Cathedral, which has remained one of the most celebrated of the world. This complicated piece of mechanism exhibits the motions of the heavenly bodies, and a perpetual almanac on which a large figure points out the days of the month. The quarter-hours are struck as follows: the first by a child with an apple, the second by a youth with an arrow, the third by a man with a cane, and the last by an old man with his crutch. The hour is struck on a bell by the figure of an angel, who opens a door and salutes the Virgin Mary. Near the first angel stands a second, who holds an hour-glass, which he turns as soon as the striking of the hour is finished. A golden cock also announces the hours by flapping his wings and crowing thrice. Upon the construction of this clock,—a remarkable work, considering the state of mechanism generally at that day,—many wealthy cities of France, Germany, Italy, and the Netherlands erected huge municipal or cathedral clocks, vying with one another in programmes of varied performance. Most of these have since been more or less modernized, no doubt, but at that period none of them could be relied upon for the time of day, there being scarcely a clock in existence up to the middle of the sixteenth century that did not vary from true time at least thirty minutes in each twenty-four hours.

The great epoch in clock-making is the application of the pendulum as a regulating power, variously claimed for Galileo about 1650, Huygens about 1657, and Richard Harris, a London

artist, in 1641. Probably all deserve credit, but the practical production was Huygens's clock. It, however, required a light pendulum and great arcs of oscillation, and about ten years later Dr. Hooke invented the anchor escapement, which enabled less maintaining power to carry a heavier pendulum. This was practically introduced by Clement, a London clock-maker, in 1680, and is still usually employed in ordinary clocks. It is a solution of the problem how to make the pendulum govern the clock instead of the clock governing the pendulum, as has been said to be the fault with Huygens's clock. The defect of Clement's escapement was what is called the recoil, which was very well obviated by Graham, an English watchmaker, early in the last century, by his dead-beat escapement, in which the wheels are kept at rest during the whole oscillation of the pendulum except at the instant of contact with the crown-wheel, and the oscillations are made in more nearly equal time. This same Graham afterwards placed the world under further obligations to him by inventing the mercurial pendulum, in which the pendulum-weight is a jar of quicksilver, the contraction and expansion of which reverse the contraction and expansion of the metal of the pendulum, and thus, by keeping the pendulum always the same length, cause it to oscillate always at the same rate. This object is also sought in the grid-iron pendulum, invented in 1726, composed of rods of steel and brass banded together, which, however, is generally not so satisfactory as the other.

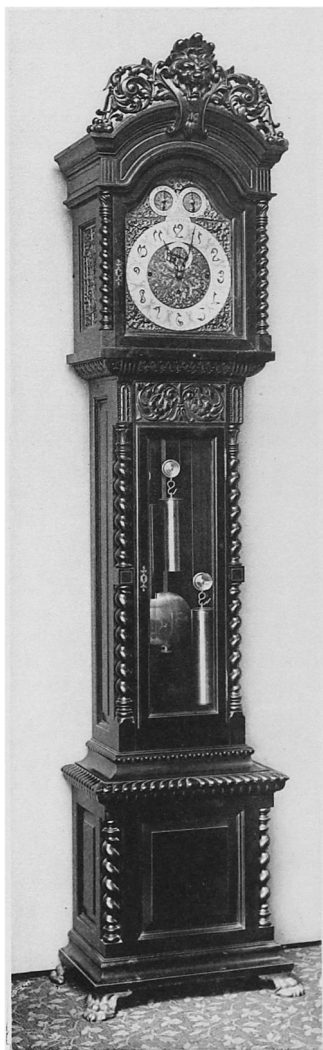
The first clocks were of great bulk; as they improved in construction and

utility they became smaller. Still, there could be no portable clocks, nor even small ones for mantels and brackets in dwelling-houses, until the weight as a moving power was got rid of. The substitution of a mainspring for a weight took place about the middle of the sixteenth century. This led to the invention of the fusee, and naturally gave birth to watches.

The striking-work of a clock is a curious and interesting piece of machinery, some clocks striking hours, half-hours, and quarters; others, like many of the fashionable tall clocks such as that shown in our illustration, striking the hour on a deep-toned gong, and chiming quarter-hours in exact imitation of the chimes of celebrated cathedrals. The bell is an important part of the striking-apparatus. In domestic clocks a small saucer-shaped bell or little gong of beaten metal answers, but where a cathedral clock is to send its sound over a wide circuit the case is very different. A gong of beaten metal may be made to yield as deep and, to a passer-by, as loud a tone, though it weigh but a score or two of pounds, as a bell of ten tons; but the gong will not be heard three hundred yards off, while the peal of the bell will travel four or five miles. The hour-bell of St. Paul's Cathedral is often heard at night at Windsor Castle, nearly twenty miles off, yet it weighs but five and one-quarter tons, while that at Notre Dame, Paris, weighs over twelve tons, that at Novgorod thirty-one tons, one at Pekin fifty-three tons, the bell at the Kremlin sixty-three tons, and the great bell of Moscow, broken in 1737, weighed one hundred and ninety-three tons.

Among remarkable clocks of the very complicated kind, besides the celebrated ones of Strasburg, Berne, Lyons, and others in Europe, is the Meier clock, exhibited in New York in 1880, which is eighteen feet high, eight feet wide, and five feet deep, having two thousand wheels, run by seven-hundred-pound weights, and wound up every twelve days. Its maker spent ten years on it. In addition to the marvels of its striking by the employment of typical figures, astronomical calculations showing correct movements of the planets for two hundred years, leap-years included, a calendar of great thoroughness, etc., there is a gathering of all the Presidents of the United States down to Garfield at every hour.

Many less intricate clocks, however, have a greater claim to be considered curiosities. Thus, some made in the seventeenth century were moved by balls running down inclined planes and swallowed up by traversing the bodies of brazen serpents, or descending in metallic grooves to be again thrown up by Archimedean screws. Some were made to go by their own weight descending inclined planes and thus avoiding the casualties to which weight-lines and mainsprings are liable, while others by means of springs ascended such planes. One was hung like a lamp from the ceiling, kept going by its own descent, and wound by pushing it towards the ceiling. The dial of another formed the brim of a plate filled with water, in which swam a tortoise made to point to the hour by magnetic attraction. A clock no longer uncommon is the one showing exact time without appearing to have



TALL CLOCK, DESIGNED BY BAILEY, BANKS & BIDDLE.

any works, the hands proceeding from the centre of a transparent crystal plate having no accountable connection with works of any kind.

Clocks have been made to go for long periods with one winding,—for a whole year is nothing extraordinary; many go for four hundred or five hundred days, some for two or three years, and there is one at Versailles which is said to need winding but once in a century.

Apart from the progress of invention in the construction of clocks and the curiosities of their mechanism, the history of fashions in them is an interesting study from about the time of the beginning of the Louis XIV. era, partaking as they did thenceforth of the characteristics of the furnishing and interior decoration of each epoch, constituting, when correct taste prevailed, one of the most pleasing and valuable features in the adornment of an apartment, and being often far from disagreeable to the eye even in times when furniture had departed from correct principles of beauty. French clocks of the Louis XIV. period furnish some of the most graceful and elegant decorative bits of the grand century, enriched with the finest gilding, marqueterie, and Buhl; those of the Louis XV. reign do not suffer like most interior objects for lack of the severity and power then so conspicuously wanting everywhere, and the undulating, incrustated, and in all ways highly-embellished surfaces and outlines are favorably seen in the cases of time-keepers. Louis XVI. clocks furnish beautiful bronze-work, and many good instances of extreme elaboration. They are as remarkable for this as those of

the Empire for severity. The clocks and clock-sets of the First Empire, if somewhat chilling to the eye in their coldness, severe lines, unrelieved projections, and sharp angles, are usually of exquisite execution, first-class material, fine bronze-work, and possess a distinctive style which often is seen at its best as a foil to the richness of decoration now popular.

In England the Dutch taste which overran everything, and the spirit of imitation of the French rococo,—both of which flourished in clock-making for a time,—were supplanted in the middle of the eighteenth century by the excellent taste of Adams and Chippendale, particularly the latter, and clocks exemplified the best English work of the day. After the introduction into England of Spanish mahogany, this fine wood became a favorite casing. Many Old English tall clocks, fine examples both of the best clock-work of their period and of correct English taste in casing in oak, chestnut, ash, beech, and mahogany, came to the colonies prior to the Revolution, and have been useful models for the American designer in the present revival of artistic handicraft.

At present clocks are fashionable of every size, and apparently of all possible varieties of use: for the mantel, the bracket, the cabinet, the dressing-table, the carriage, and for every apartment in the dwelling, including all shapes and sizes, from the magnificent hall and library clocks, eight or nine feet high, to the "mignon" travelling clocks small enough for the pocket.

Great quantities of excellent inexpensive clocks are now made abroad. Black marble cases are largely made in

Belgium. French manufacturers, by improved machinery, produce a very accurate inexpensive movement, which can be fitted with these and other cases and sold at surprisingly low figures, compared with the cost of any similar work in this country. Almost all mantel clocks of the better grade come from France. Great taste in dials has been developed of late years in this country, the plain black and white ones formerly seen everywhere having given way to bright colors and artistic shapes.

Tall clocks are greatly in vogue at present, and almost a necessity in fashionable furnishing, most houses fitted up in first-class modern style possessing several, frequently matching surrounding wood-work. The favorite woods are mahogany, antique, quartered, and plain oak, and black walnut. The movements imported by Messrs. Bailey, Banks & Biddle are cased after designs by their own artists, or in styles specially reproduced for the house from the most excellent models of the best decorative periods, with perhaps some modifications or adaptations to the taste of to-day. The movements are of the finest English manufacture, many of them chiming on sweet-toned gongs and bells in exact

imitation of the celebrated minster and cathedral chimes of Westminster, Canterbury, Oxford, Cambridge, Whittington, Bow-bells, etc., striking the hour on a gong giving the sound of the famous Big Ben of Westminster. Others are in plain Colonial style. Some have the English tube-chimes instead of bells. The movements are of high finish and very accurate time-keepers.

There are many people in France and Germany who live by making so-called "old clocks," chiefly for selling to tourists as antiques. These are sometimes done so well that it is not easy even for an expert to distinguish them from the genuine.

In the small travelling or carriage clocks the fancy of the designer has full play, not only in decoration, but in shape. They strike on tiny cathedral gongs, and many of them repeat quarter-hours and minutes on different bells of remarkable sweetness of tone. Some also have an alarm. These clocks are made in crystal and gilt, cloisonné and Limoges enamel and ormolu, and are naturally great favorites with ladies, being suitable ornaments for dressing-tables, bureaux, cabinets, etc., at home, as well as useful in travelling.

W. P.

